



Overview of ectopic pancreas

Chang-Fei Li, Qiu-Ru Li, Miao Bai, Yuan-Shi Lv, Yan Jiao

Specialty type: Gastroenterology and hepatology

Provenance and peer review: Invited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): 0
Grade C (Good): C, C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Chebli JMF, Brazil

Received: December 18, 2023

Peer-review started: December 18, 2023

First decision: January 11, 2024

Revised: January 18, 2024

Accepted: February 5, 2024

Article in press: February 5, 2024

Published online: February 27, 2024



Chang-Fei Li, Patient Service Center, The Second Hospital of Jilin University, Changchun 130000, Jilin Province, China

Qiu-Ru Li, Department of Neurology, The Second Hospital of Jilin University, Changchun 130000, Jilin Province, China

Miao Bai, Department of Fundus Disease, The Second Hospital of Jilin University, Changchun 130000, Jilin Province, China

Yuan-Shi Lv, Department of Thyroid Head and Neck Surgery, Jilin Cancer Hospital, Changchun 130000, Jilin Province, China

Yan Jiao, Department of Hepatobiliary and Pancreatic Surgery, General Surgery Center, The First Hospital of Jilin University, Changchun 130021, Jilin Province, China

Corresponding author: Yan Jiao, MD, PhD, Surgeon, Department of Hepatobiliary and Pancreatic Surgery, General Surgery Center, The First Hospital of Jilin University, No. 1 Xinmin Street, Changchun 130021, Jilin Province, China. lagelangri1@126.com

Abstract

This editorial discusses the article written by Zheng *et al* that was published in the latest edition of the *World Journal of Gastrointestinal Surgery*. Our primary focus is on the causes, location, diagnosis, histological classification, and therapy of ectopic pancreas. Ectopic pancreas refers to the presence of pancreatic tissue that is situated in a location outside its usual anatomical placement, and is not connected to the normal pancreas in terms of blood supply or anatomical structure. Currently, the embryological origin of ectopic pancreas remains uncertain. The most prevalent form of ectopic pancreatic is gastric ectopic pancreas. Endoscopic ultrasonography examination can visualize the morphological characteristics of the ectopic pancreatic lesion and pinpoint its anatomical location. The histological categorization of ectopic pancreas evolves. Endoscopic treatment has been widely advocated in ectopic pancreas.

Key Words: Pancreas; Gastric ectopic pancreas; Diagnosis; Treatment; Anatomy

©The Author(s) 2024. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: Ectopic pancreas is a rare disease. At present, the study on ectopic pancreas is mostly limited to case reports. Endoscopic ultrasonography is the main examination method for the diagnosis. This editorial shed a light on the ectopic pancreas from the overview of etiology, anatomical site, diagnosis, histological type, and treatment.

Citation: Li CF, Li QR, Bai M, Lv YS, Jiao Y. Overview of ectopic pancreas. *World J Gastrointest Surg* 2024; 16(2): 284-288

URL: <https://www.wjgnet.com/1948-9366/full/v16/i2/284.htm>

DOI: <https://dx.doi.org/10.4240/wjgs.v16.i2.284>

INTRODUCTION

Congenital anomalies such as pancreatic dysplasia, which include common pancreas division, unusual annular pancreas, and ectopic pancreas, have been identified[1,2]. Ectopic pancreas refers to the presence of pancreatic tissue at a location that is not typical for the pancreas. This tissue is separated from the normal pancreas in terms of its blood supply, nerves, and anatomical connection[3]. Ectopic pancreas is a congenital anatomical abnormality that can arise in several locations within the digestive tract and other areas[4]. It is frequently located in the stomach (particularly the antrum), duodenum, jejunum, Meckel diverticulum, as well as the ileum, liver, spleen, bile duct, omentum, fallopian tube, and so on[5,6]. The incidence of ectopic pancreas ranges from 0.5% to 13% in the general population in autopsy series[7-10].

ETIOLOGY

The process of pancreatic development is quite intricate[11]. Congenital malformations are categorized as fusion abnormalities, migration abnormalities, and replication abnormalities. Currently, the embryological origin of ectopic pancreas remains uncertain. The largely recognized idea is the dislocation theory, which proposes that pancreatic tissue deposits become detached from the primary pancreas and are then relocated to other developing organs, particularly the gastrointestinal system.

ANATOMICAL SITE

The occurrence of ectopic pancreas in the digestive tract is most prevalent, particularly in the proximal region of the gastrointestinal tract[12]. Gastric ectopic pancreas is primarily seen in the digestive tract[13]. Gastric ectopic pancreas is most frequently found within a distance of 6 cm from the greater curvature of the stomach, namely near the pylorus[14]. It may also be present in other areas, however the occurrence is infrequent[15]. Ectopic pancreas typically resides within the submucosa or muscularis propria layer[16]. Currently, the identification of the lesion's source can be achieved using pathology or endoscopic ultrasonography, which can then be used to direct the appropriate treatment[17].

DIAGNOSIS

Ectopic pancreas is observed as submucosal masses with intraluminal growth patterns during endoscopic examination [18,19]. Endoscopic ultrasonography examination can visualize the morphological characteristics of ectopic pancreas lesions and pinpoint the location from which the ectopic pancreas originates[20,21]. If deemed required, a fine needle puncture can be conducted with the use of endoscopic ultrasonography guidance[22,23]. Under ultrasonography gastroscopy, the stomach wall exhibits a distinct five-layer structure[24]. Common ultrasonography endoscopic findings of ectopic pancreas include submucosal masses with high echogenicity, low echogenicity, or equiechogenicity. These masses typically originate from the submucosal layer or intrinsic muscle layer[25,26]. Certain lesions exhibit a combination of echogenicity, which could be indicative of degeneration or the development of cysts[27].

HISTOLOGICAL TYPE

When examining the ectopic pancreatic tissue under a microscope, it is observed that the ductal system is linked to the intestinal cavity. This connection may pose challenges in terms of visualization during imaging procedures. While Schultz initially documented ectopic pancreas in 1727, it was not until 1859 when Klob provided a histological confirmation of its existence[28]. Heinrich introduced the initial histological classification system in 1909, which outlined three distinct categories of ectopic pancreas[29]. The most prevalent tissue type of ectopic pancreas is the same as that found in the normal pancreas, encompassing all cellular components such as acini, ducts, and pancreatic islet cells. The second histological type primarily consists of acini, while the third kind primarily consists of ducts. In 1973, Fuentes

Table 1 Histological classification of ectopic pancreas

| Classification | Heinrich's classification | Fuentes's classification |
|----------------|--|--|
| I | All components of normal pancreatic tissue, including acini, ducts, and pancreatic islet cells | All components of normal pancreatic tissue, including acini, ducts, and pancreatic islet cells |
| II | Composed of acini and ducts, without pancreatic islet cells | Composed of ducts |
| III | Composed of ducts | Composed of acini (exocrine) |
| IV | | Composed of pancreatic islet cells (endocrine) |

made additional changes to the classification scheme. This included the addition of a fourth type of ectopic pancreatic tissue, which consisted solely of pancreatic islet cells (Table 1)[28].

TREATMENT

With the rapid advancement of endoscopic technology in recent years, there has been widespread promotion of endoscopic treatment[30]. Nevertheless, the selection of therapeutic approaches must be dependent on the lesion's location, size, and its interaction with neighboring organs[31]. The existing techniques employed for the endoscopic treatment of ectopic pancreas encompass endoscopic submucosal dissection, submucosal tunnel endoscopic resection (STER), endoscopic high-frequency resection, mucosal resection, and endoscopic full-thickness resection[7,32,33]. Certain lesions can be eliminated with ligation[34]. If the ectopic pancreas arises from the muscular layer or grows through the entire wall of the organ, or if the growth is located outside the reach of endoscopy, it is indicated to have local surgical excision for treatment[35]. If there is a possibility of cancer, it is advisable to undertake aggressive surgery for resection[36]. Certain individuals with malignant transformation may necessitate adjuvant chemotherapy following surgical intervention. Zheng *et al*[37] reported that laparoscopic resection is better for large gastric ectopic pancreas with a deep origin, which has added new clue for the surgical treatment in the field of ectopic pancreas. Meanwhile, multicenter large-scale studies are needed to describe its characteristics and evaluate the safety due to the rarity of gastric ectopic pancreas.

CLINICAL IMPLICATIONS

The etiology of ectopic pancreas remains uncertain and is thought to be associated with congenital anomalies. Ectopic pancreas can manifest in various locations throughout the body, with a particular predilection for the digestive tract. The stomach has the highest incidence rate. Diagnosis involves determining the location and nature of the condition, typically with the help of medical imaging. However, the findings from imaging tests do not provide particular information, and the diagnosis ultimately depends on a pathological examination. There is currently no standardized approach to treatment, and individualized diagnoses and treatment strategies must be established according to the patient's specific condition. Presently, it is advised to actively provide treatment to patients displaying symptoms, prioritize thorough postoperative monitoring, and opt for endoscopic treatment as the preferred technique of treatment. Nevertheless, for patients with the potential for malignant development, surgical intervention is the preferred course of treatment.

CONCLUSION

Ectopic pancreas refers to the presence of pancreatic tissue at a location that is not typical for the pancreas, and it is not connected to the normal pancreas in terms of blood supply or anatomy. Currently, the embryological origin of ectopic pancreas remains uncertain. The most prevalent form of ectopic pancreatic is gastric ectopic pancreas. Endoscopic ultrasonography examination can visualize the morphological characteristics of ectopic pancreas lesions and detect the precise location of the ectopic pancreas. The histological categorization of ectopic pancreas is being developed. Many patients with ectopic pancreas remain completely asymptomatic throughout their lives and without developing any complications. Endoscopic treatment has been widely advocated in symptomatic ectopic pancreas.

FOOTNOTES

Author contributions: Jiao Y designed the overall concept and outline of the manuscript; Li CF contributed to the discussion and design of the manuscript; Li QR, Bai M, and Lv YS contributed to the writing, and editing the manuscript, illustrations, and review of literature.

Conflict-of-interest statement: All the authors report no relevant conflicts of interest for this article.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country/Territory of origin: China

ORCID number: Yan Jiao 0000-0001-6914-7949.

S-Editor: Gong ZM

L-Editor: A

P-Editor: ZhangYL

REFERENCES

- Borghei P,** Sokhandon F, Shirkhoda A, Morgan DE. Anomalies, anatomic variants, and sources of diagnostic pitfalls in pancreatic imaging. *Radiology* 2013; **266**: 28-36 [PMID: 23264525 DOI: 10.1148/radiol.12112469]
- Breunig M,** Merkle J, Wagner M, Melzer MK, Barth TFE, Engleitner T, Krumm J, Wiedenmann S, Cohrs CM, Perkhofer L, Jain G, Krüger J, Hermann PC, Schmid M, Madácsy T, Varga Á, Griger J, Azoitei N, Müller M, Wessely O, Robey PG, Heller S, Dantes Z, Reichert M, Günes C, Bolenz C, Kuhn F, Maléth J, Speier S, Liebau S, Sipos B, Kuster B, Seufferlein T, Rad R, Meier M, Hohwieler M, Kleger A. Modeling plasticity and dysplasia of pancreatic ductal organoids derived from human pluripotent stem cells. *Cell Stem Cell* 2021; **28**: 1105-1124.e19 [PMID: 33915078 DOI: 10.1016/j.stem.2021.03.005]
- Hashimoto R,** Matsuda T. Jejunal Ectopic Pancreas. *Clin Gastroenterol Hepatol* 2019; **17**: A43 [PMID: 29654919 DOI: 10.1016/j.cgh.2018.04.010]
- Mundackal N,** Arslan ME, Decker C, Lee H, Nigam A. The removal of ectopic pancreas to prevent carcinoma development. *Am J Surg* 2021; **222**: 1196-1197 [PMID: 34256929 DOI: 10.1016/j.amjsurg.2021.07.002]
- Liu X,** Wu X, Tuo B, Wu H. Ectopic pancreas appearing as a giant gastric cyst mimicking gastric lymphangioma: a case report and a brief review. *BMC Gastroenterol* 2021; **21**: 151 [PMID: 33823798 DOI: 10.1186/s12876-021-01686-9]
- Matsumoto T,** Tanaka N, Nagai M, Koike D, Sakurao Y, Kubota K. A case of gastric heterotopic pancreatitis resected by laparoscopic surgery. *Int Surg* 2015; **100**: 678-682 [PMID: 25875550 DOI: 10.9738/INTSURG-D-14-00182.1]
- Ryu DY,** Kim GH, Park DY, Lee BE, Cheong JH, Kim DU, Woo HY, Heo J, Song GA. Endoscopic removal of gastric ectopic pancreas: an initial experience with endoscopic submucosal dissection. *World J Gastroenterol* 2010; **16**: 4589-4593 [PMID: 20857531 DOI: 10.3748/wjg.v16.i36.4589]
- DeBord JR,** Majarakis JD, Nyhus LM. An unusual case of heterotopic pancreas of the stomach. *Am J Surg* 1981; **141**: 269-273 [PMID: 7457747 DOI: 10.1016/0002-9610(81)90172-0]
- Chandan VS,** Wang W. Pancreatic heterotopia in the gastric antrum. *Arch Pathol Lab Med* 2004; **128**: 111-112 [PMID: 14692822 DOI: 10.5858/2004-128-111-PHITGA]
- Jiang LX,** Xu J, Wang XW, Zhou FR, Gao W, Yu GH, Lv ZC, Zheng HT. Gastric outlet obstruction caused by heterotopic pancreas: A case report and a quick review. *World J Gastroenterol* 2008; **14**: 6757-6759 [PMID: 19034986 DOI: 10.3748/wjg.14.6757]
- Skandalakis LJ,** Rowe JS Jr, Gray SW, Skandalakis JE. Surgical embryology and anatomy of the pancreas. *Surg Clin North Am* 1993; **73**: 661-697 [PMID: 8378816 DOI: 10.1016/s0039-6109(16)46080-9]
- Rodríguez-Seguel E,** Villamayor L, Arroyo N, De Andrés MP, Real FX, Martín F, Cano DA, Rojas A. Loss of GATA4 causes ectopic pancreas in the stomach. *J Pathol* 2020; **250**: 362-373 [PMID: 31875961 DOI: 10.1002/path.5378]
- Muroni M,** Lombardi M, Ferranti S. Gastric Ectopic Pancreas and Recurrent Pancreatitis. *J Gastrointest Surg* 2023; **27**: 2260-2262 [PMID: 37231241 DOI: 10.1007/s11605-023-05704-x]
- Qian L,** Yang J, Zhang J. Gastric ectopic pancreas adenocarcinoma: A case report and literature review. *Saudi Med J* 2023; **44**: 1174-1179 [PMID: 37926464 DOI: 10.15537/smj.2023.44.11.20220914]
- Ayyanar P,** Tripathy BB, Pati AB, Mohanty MK, Sable M. Ectopic pancreas, gastric, duodenal and colonic tissue in a case of persistent umbilical discharge: Report of two patients with review of literature. *Indian J Pathol Microbiol* 2023; **66**: 403-406 [PMID: 37077097 DOI: 10.4103/ijpm.ijpm_526_21]
- Ourô S,** Taré F, Moniz L. [Pancreatic ectopia]. *Acta Med Port* 2011; **24**: 361-366 [PMID: 22011611]
- Matsushita M,** Hajiro K, Okazaki K, Takakuwa H. Gastric aberrant pancreas: EUS analysis in comparison with the histology. *Gastrointest Endosc* 1999; **49**: 493-497 [PMID: 10202065 DOI: 10.1016/s0016-5107(99)70049-0]
- Wei R,** Wang QB, Chen QH, Liu JS, Zhang B. Upper gastrointestinal tract heterotopic pancreas: findings from CT and endoscopic imaging with histopathologic correlation. *Clin Imaging* 2011; **35**: 353-359 [PMID: 21872124 DOI: 10.1016/j.clinimag.2010.10.001]
- Gottschalk U,** Dietrich CF, Jenssen C. Ectopic pancreas in the upper gastrointestinal tract: Is endosonographic diagnosis reliable? Data from the German Endoscopic Ultrasound Registry and review of the literature. *Endosc Ultrasound* 2018; **7**: 270-278 [PMID: 28836514 DOI: 10.4103/eus.eus_18_17]
- Flores A,** Papafragkakis C, Uberoi AS, Thaiudom S, Bhutani MS. EUS of an atypical ectopic pancreas. *Endosc Ultrasound* 2018; **7**: 216-217 [PMID: 29697071 DOI: 10.4103/eus.eus_111_17]
- Endo S,** Saito R, Ochi D, Yamada T, Hirose M, Hiroshima Y, Yamamoto Y, Ueno T, Hasegawa N, Moriwaki T, Narasaka T, Kaneko T, Fukuda K, Suzuki H, Mizokami Y, Hyodo I. Effectiveness of an endoscopic biopsy procedure using EUS-FNA and EMR-C for diagnosing adenocarcinoma arising from ectopic pancreas: two case reports and a literature review. *Intern Med* 2014; **53**: 1055-1062 [PMID: 24827484 DOI: 10.2169/internalmedicine.53.1420]
- Kida M,** Kawaguchi Y, Miyata E, Hasegawa R, Kaneko T, Yamauchi H, Koizumi S, Okuwaki K, Miyazawa S, Iwai T, Kikuchi H, Watanabe

- M, Imaizumi H, Koizumi W. Endoscopic ultrasonography diagnosis of subepithelial lesions. *Dig Endosc* 2017; **29**: 431-443 [PMID: 28258621 DOI: 10.1111/den.12854]
- 23 **Attwell A**, Sams S, Fukami N. Diagnosis of ectopic pancreas by endoscopic ultrasound with fine-needle aspiration. *World J Gastroenterol* 2015; **21**: 2367-2373 [PMID: 25741143 DOI: 10.3748/wjg.v21.i8.2367]
- 24 **Pellicano R**, Bruno M, Fagoonee S, Ribaldone DG, Fasulo R, De Angelis C. Endoscopic ultrasound in the preoperative staging of gastric cancer: key messages for surgeons. *Minerva Chir* 2015; **70**: 417-427 [PMID: 26354328]
- 25 **Park SH**, Kim GH, Park DY, Shin NR, Cheong JH, Moon JY, Lee BE, Song GA, Seo HI, Jeon TY. Endosonographic findings of gastric ectopic pancreas: a single center experience. *J Gastroenterol Hepatol* 2011; **26**: 1441-1446 [PMID: 21557771 DOI: 10.1111/j.1440-1746.2011.06764.x]
- 26 **Zinkiewicz K**, Juszkiewicz W, Zgodziński W, Szumiło J, Cwik G, Furtak J, Maciejewski R, Wallner G. Ectopic pancreas: endoscopic, ultrasound and radiological features. *Folia Morphol (Warsz)* 2003; **62**: 205-209 [PMID: 14507048]
- 27 **Shanhogue AK**, Fasih N, Surabhi VR, Doherty GP, Shanhogue DK, Sethi SK. A clinical and radiologic review of uncommon types and causes of pancreatitis. *Radiographics* 2009; **29**: 1003-1026 [PMID: 19605653 DOI: 10.1148/rg.294085748]
- 28 **Trifan A**, Târcoveanu E, Danciu M, Huțanașu C, Cojocariu C, Stanciu C. Gastric heterotopic pancreas: an unusual case and review of the literature. *J Gastrointest Liver Dis* 2012; **21**: 209-212 [PMID: 22720312]
- 29 **Akbari AH**, Putra J. Type 1 Choledochal Cyst with Ectopic Pancreas and Septate Gallbladder. *Fetal Pediatr Pathol* 2022; **41**: 334-337 [PMID: 32723208 DOI: 10.1080/15513815.2020.1797962]
- 30 **Hawes RH**. Endoscopic innovations. *Gastrointest Endosc* 2013; **78**: 410-413 [PMID: 23948188 DOI: 10.1016/j.gie.2013.07.005]
- 31 **Zhou Y**, Zhou S, Shi Y, Zheng S, Liu B. Endoscopic submucosal dissection for gastric ectopic pancreas: a single-center experience. *World J Surg Oncol* 2019; **17**: 69 [PMID: 30992068 DOI: 10.1186/s12957-019-1612-x]
- 32 **Vitiello GA**, Cavnar MJ, Hajdu C, Khaykis I, Newman E, Melis M, Pachter HL, Cohen SM. Minimally Invasive Management of Ectopic Pancreas. *J Laparoendosc Adv Surg Tech A* 2017; **27**: 277-282 [PMID: 28121494 DOI: 10.1089/lap.2016.0562]
- 33 **Matsushita M**, Hachimine D, Nishio A, Seki T, Okazaki K. Endoscopic and/or laparoscopic full-layer resection of gastric ectopic pancreas arising from submucosal and muscular layers. *Gastrointest Endosc* 2016; **84**: 547 [PMID: 27530483 DOI: 10.1016/j.gie.2016.02.035]
- 34 **Wu Y**, Xu W, Chen C, Chai H, Sun C, Liu J. Ligation-assisted endoscopic mucosal resection for duodenal neuroendocrine tumor. *Rev Esp Enferm Dig* 2023 [PMID: 37882227 DOI: 10.17235/reed.2023.9985/2023]
- 35 **Paolucci P**, Brasesco OE, Rosin D, Saber AA, Avital S, Berho M, Rosenthal RJ. Laparoscopic resection of ectopic pancreas in the gastric antrum: case report and literature review. *J Laparoendosc Adv Surg Tech A* 2002; **12**: 139-141 [PMID: 12019576 DOI: 10.1089/10926420252939691]
- 36 **Chang TK**, Huang CW, Ma CJ, Su WC, Tsai HL, Wang JY. Ectopic pancreas mimicking gastric submucosal tumour treated using robotic surgery. *J Minim Access Surg* 2020; **16**: 179-181 [PMID: 30777986 DOI: 10.4103/jmas.JMAS_1_19]
- 37 **Zheng HD**, Huang QY, Hu YH, Ye K, Xu JH. Laparoscopic resection and endoscopic submucosal dissection for treating gastric ectopic pancreas. *World J Gastrointest Surg* 2023; **15**: 2799-2808 [PMID: 38222013 DOI: 10.4240/wjgs.v15.i12.2799]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: office@baishideng.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

